

# SURFACE WATER AMBIENT TOXIC MONITORING PROGRAM

STATE OF MAINE

2000

DIVISION OF ENVIRONMENTAL ASSESSMENT  
MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION  
AUGUSTA, MAINE 04333

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## INTRODUCTION

The 2000 Surface Water Ambient Toxic (SWAT) monitoring program final report is organized into an executive summary and 4 modules, 1) Marine and Estuarine, 2) Lakes, 3) Rivers and Streams, and 4) Special Studies. Within each module results are presented in the order of the 2000 workplan. There are also a separate appendix with fish lengths and weights for all modules, and separate complete final reports of the 1) Loon Effects Study and 2) Kennebec River Caged Mussel Study that were too large to include with the appropriate module report. All of the data have been used as soon as received in DEP's water quality management activities wherever appropriate.

The full report is available on DEP's website at  
<http://www.state.me.us/dep/blwq/monitoring.htm>

Click on "programs", then scan down the page to "Surface Water Ambient Toxics Monitoring Program (SWAT)" and choose the module of your interest.

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Most chemical analyses were performed by the Senator George J. Mitchell Center for Environmental and Watershed Research Environmental Chemistry Laboratory (formerly the Water Research Institute) at the University of Maine. Other analyses were conducted as listed in reports of individual sections.

## **EXECUTIVE SUMMARY**

Maine's Surface Water Ambient Toxics (SWAT) monitoring program was established in 1993 (38 MRSA §420-B) to determine the nature, scope and severity of toxic contamination in the surface waters and fisheries of the State. The program must be designed to comprehensively monitor the lakes, rivers and streams and marine and estuarine waters of the State on an ongoing basis. The program must incorporate testing for suspected toxic contamination in biological tissue and sediment, may include testing of the water column and must include biomonitoring and the monitoring of the health of individual organisms that may serve as indicators of toxic contamination. This program must collect data sufficient to support assessment of the risks to human and ecological health posed by the direct and indirect discharge of toxic contaminants.

The Commissioner of the Department of Environmental Protection (DEP) must prepare a 5 year workplan that outlines monitoring objectives for the following 5 years. The Commissioner must also develop an annual workplan that defines the work to be accomplished each year. A Technical Advisory Group (TAG), composed of 10 individuals with scientific backgrounds representing various interests and 1 legislator, is established to advise the Commissioner on the development of the 5-year and annual workplans.

The first 5-year plan, for the period 1994-1998, was an initial survey of waterbodies from watersheds around the entire state. The current 5-year plan, for the period 1999-2003, is focused on problems discovered in the initial sampling and is designed to confirm the initial findings and establish background conditions. Once those are established and a sufficient amount of time has elapsed, 5-10 years depending on what if any action has occurred to solve the problem, repeat sampling may be conducted to establish trends. The program also explores new issues.

The SWAT program is divided into 4 modules, 1) Marine and Estuarine, 2) Lakes, 3) Rivers and Streams, and 4) Special Studies. This annual report follows the outline of the 2000 workplan. Following is a summary of key findings from the 2000 SWAT program for each module.

### **1. MARINE AND ESTUARINE**

- As part of a long-term status and trends program, shellfish tissue analysis is repeated at various baseline stations periodically. Mussel tissues were analyzed for metals, pesticides, PCBs, and PAHs (polynuclear aromatic hydrocarbons) from Englishman's Bay, Southwest Harbor, Blue Hill Falls, Belfast Harbor, and three locations in Boothbay Harbor. Mussels from Mill Cove in Boothbay Harbor had elevated copper and lead. All other results were within the normal range. Single samples were collected in 1986 and analyzed for metals at the three locations in Boothbay Harbor that were re-sampled in 2000. In Boothbay Harbor's Outer Harbor lead, copper, and mercury are no longer elevated. West Harbor no longer has elevated lead, nickel, copper and mercury. Copper and lead continue to be elevated in Mill Cove while nickel and zinc are no longer elevated. All other locations continue to have levels within the normal range when compared to previous samples taken between 1987 and 1991. At Southwest Harbor there was concern that copper was near the elevated level in 1991. In 2000, copper was lower and well within the normal range. Organic chemicals were not measured in the previous samples.

- Mercury levels in striped bass are similar at most locations in Maine, while PCB levels are more variable. Concentrations of PCBs in fish from the Kennebec River, that may be a river specific population, seem to be lower than in fish from other rivers, that may consist of fish from more contaminated regions south of Maine. Concentrations of both contaminants in fish from most rivers exceed the Maine Bureau of Health Fish Tissue Action Levels. Striped bass will be collected from 7 rivers in 2002 and analyzed for these contaminants to verify any geographic patterns.
- A study of the sediments of the Merrymeeting Bay area documented that the upstream Androscoggin and Kennebec Rivers have been and may continue to be significant sources of toxic heavy metals and dioxins to the Bay and nearshore Gulf of Maine.

## 2. LAKES

- Monitoring of mercury in rain, snow, and sleet at 4 locations in Maine as part of the national Mercury Deposition Network documented that coastal areas receive more mercury deposition than do inland areas. These results implicate the US eastern seaboard as well as other upwind states as significant sources of mercury to Maine. National data show that deposition is higher in most other eastern and mid-western states that are in the program and presumably closer to major sources.
- Analysis of fish from Maine lakes for mercury and DDT to help refine Fish Consumption Advisories documented that concentrations of mercury in most lakes exceeded the Maine Bureau of Health Fish Tissue Action Levels (FTAL) similar to those of recent years. Concentrations of DDT in fish from one pond near an orchard approached the FTAL, but concentrations in fish from other lakes were well below the FTAL.
- Studies of the effects of mercury on loons indicate that 30% of Maine's loons are at risk, predicting an unsustainable population. Studies of sharptailed sparrows, black terns, mink and otter were initiated and continued in 2001. Mercury concentrations in some mink and otter fur samples exceeded critical levels (thresholds for adverse effects) for these species. Additional studies will be conducted in 2002 to expand the database and to begin to assess population level impacts.
- Despite some incidental reductions of air emissions of mercury since the enactment of the Clean Air Act of 1970 and the 1990 amendments, atmospheric deposition of mercury to Maine continues to increase and fish mercury generally follows suit. Analysis of a sediment core from one lake demonstrates that the mercury input to this remote lake began to increase above background in the mid-1800s and that this increase continues to the present. The brook trout and lake trout populations from this lake both had significant increases in mercury concentration over time. Fish mercury also significantly increased in two other brook trout populations, did not change significantly in two lake trout populations, and decreased in two white sucker populations. The results of this study are generally consistent with the literature, where increases in fish mercury concentration over recent time

have been found for the majority of cases investigated. The decrease in white sucker mercury content may reflect some factor inherent in this species, or in the lakes from which they were collected. Directed reductions of emissions in Maine (municipal waste combustors and a chloralkali facility) since 1997 are too recent to be observed in reduced fish concentrations yet and too local to have been detected in this study of Northern Maine lakes.

### 3. RIVERS AND STREAMS

- Total PCB levels in fish from most rivers and streams with no known point sources exceed the Maine Bureau of Health Fish Tissue Action Level. Total PCB levels in fish from the Aroostook River downstream of Loring Air Force Base both in Maine and New Brunswick are similar to levels in fish from most of those stations with no point sources.
- Only eels from the Penobscot River below Brewer exceeded Maine Bureau of Health Fish Tissue Action Levels due to dioxin alone, but fish from several other rivers and stations did because of a combination of dioxins and dioxin-like coplanar PCBs.
- DDT levels in brook trout from two streams in Aroostook County were lower than in 1994, but levels in one of them, Prestile Stream, as well as concentrations in trout from Everett Brook, still exceed the Maine Bureau of Health Fish Tissue Action Level.
- In the Biomonitoring program, 35 stations were assessed for the condition of the benthic macroinvertebrate community. Of those, 16 failed to attain their aquatic life class probably due to toxic pollutants. Of the remaining 19 that meet or exceed the classification criteria, 13 exhibit natural aquatic communities, while the remaining 6 fail due to excessive nutrients or other factors.

### 4. SPECIAL STUDIES

- DEP continued development of the use of semi-permeable membrane devices, SPMDs, as a potential surrogate for the fish above/below test for discharge of dioxins from bleached kraft pulp mills. Three deployments determined that uptake rates are increased in warmer months and biofouling is not a significant problem in month long exposures. No 2378-TCDD was measured in any deployment, but 2378-TCDF was measured in all samples. Within-site variability in concentrations was as great or greater than that measured in fish; therefore, sensitivity of SPMD tests were generally no better and sometimes worse than that of fish. Development of the SPMD method continued in 2001.
- Studies using caged mussels in the Kennebec River helped to locate areas of high PCB from Augusta to Merrymeeting Bay. Investigation of sources continues. Caged mussels were found to be not as useful as were fish in the dioxin above/below test.

- In a study funded by the 1999 SWAT program, 10 of 19 agrochemicals used in blueberry culture were screened for estrogenic activity using human mammary cells tissue in an E-Screen assay. Those found to have estrogenic activity include methoxychlor, propiconizol, and dichlorophenoxyacetic acid (2,4-D). Velpar was found not to be estrogenic confirming previous studies. The remaining 9 agrochemicals will be screened as soon as samples can be obtained. Additional studies of the androgenic or other endocrine mediated activity of these agrochemicals that may impact Atlantic salmon and other native species are needed.

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